SUTEE KIDDEE : BIOTIC AND ABIOTIC APPROACHES TO DEVELOP METHOD FOR ARBUSCULAR MYCORRHIZAL FUNGI SPORE PRODUCTION. THESIS ADVISOR : PANLADA TITTABUTR, Ph.D., 111 PP.

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Biotic and abiotic approaches have been explored to enhance the efficiency of arbuscular mycorrhizal fungi (AMF) spore propagation for the purpose of producing AMF inoculum to be used in agriculture. Among biotic approaches, the use of mycorrhization helper bacteria (MHB) is a technique that can boost AMF spore numbers when co-inoculated with AMF in host plants. In this study, some plant growth-promoting rhizobacteria (PGPR) had a positive effect on promoting fungal abundance under the substrate-based production system. Firstly, the secretion compounds from *Brevibacillus* sp. SUT47 were discovered to promote AMF spore production of *Acaulospora tuberculata* when co-inoculated on maize roots. The highest number of spores was produced when 360 mg of concentrated secretion compounds were applied which significantly increased the highest AMF spore number of 1,500 spores per plant at 120 days after inoculation. However, the application of whole cell bacteria still significantly promoted a higher number of AMF spores than that of co-inoculation with secretion compounds approximately at 2,000 spores per plant. Secondly, *Bacillus velezensis* S141 was found to promote *Rhizophagus irregularis* in symbiosis with *Lotus japonicus*. Co-inoculation with strain S141 positively influenced fungal growth and development, including AMF root colonization, spore number, and plant nutrient uptake during the tripartite interaction. Surprisingly, the ability of strain S141 to produce indole-3-acetic acid was not the key mechanism promoting this symbiosis. Nevertheless, S141 could penetrate into plant root cells and establish itself as an endophytic bacterium. Moreover, its presence induced the expression of marker genes related to the early phases of AMF colonization, nutrient uptake in host plants, and upregulation of AMF genes involved in cell cycle regulation.

Regarding abiotic approaches, Light Emitting Diode (LED) technology was employed specifically using a red and blue light ratio of 60:40, at a total light intensity of 300 µMol/m^2/s to promote *R. irregularis* colonization in maize (*Zea mays* L.) root. LED light demonstrated a significant acceleration in AMF spore production under the substrate-based condition. The AMF spore number of approximately 1,500 spores per plant was produced after 90 days after inoculation. Besides, the application of an appropriate concentration of myristic acid, a fatty acid required for AMF development, at the suitable concentration (10-10,000 µg) together with maize cultivation also tended to increase in the number of *R. irregularis* spore production.

These findings offered promising prospects to accelerate large-scale AMF spore production using substrate-based methods. Additionally, these findings highlight the potential role of PGPR as helper bacteria in supporting plant-AMF symbiosis and their potential application in sustainable agriculture practices.

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